

Optimization of Flexible Supporting Structure for Reduction of Seismic Response of Building Frames

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An optimization approach is presented for a new type of response reduction system for building frames subjected to seismic motions. The roof displacement is effectively reduced by placing a flexible structure at the base of a building frame. The base consists of rigid bars and flexible springs that are modeled by truss members. The shape and stiffness of the supporting structure are optimized using a random-start nonlinear programming combined with a response spectrum approach. The results are verified using a series time-history analyses under the spectrum-compatible seismic motions. It is shown that the roof displacement is effectively reduced by utilizing the rocking behavior of the base.

Keywords: Optimization, Seismic response, Roof displacement, Building frame, Flexible structure